

THE LARVAE OF THE HARPALINAE UNISETOSAE
(COLEOPTERA: CARABIDAE)

BY
PAO CHU (HUNG FU CHU)

B. S., Tsing Hua University, 1935

M. S., University of Illinois, 1943

AN ABSTRACT OF A THESIS

SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
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THE LARVAE OF THE HARPALINAE UNISETOSAE (COLEOPTERA: CARABIDAE)

The Unisetosae is a section belonging to the Harpaline, Carabidae, Coleoptera. A total of twenty-seven species of twelve genera and three tribes have been studied. Besides the external morphology, biology and habits, and geographical distribution, generic and species keys have been prepared. The literature has also been reviewed.

The characters used for identification were selected from a morphological study which may be described briefly as follows: The mandibular scrobe is an impression of the ectal aspect of the mandible. The number of setae in the mandibular scrobe is characteristic. On the cutting edge of the mandible, mandibular teeth are sometimes present. The ligula possesses two setae on its distal end. The bases of the ligular setae are either separate or contiguous. The labial palpus is generally two-segmented, but in some species the second segment is divided into a third small segment. The lacinia or inner lobe is a single segment with a seta either on the apex, or on the side. The lacinia may be fused with the stipes. The dentation of the nasale varies greatly in different species. A furrow extending cephalo-caudad behind the ocelli is called the ocellar furrow. It is wanting in some species. The cervical groove is a groove located on the gena and postgena behind the ocellar furrow which is present in most genera. The praeterga of the abdominal terga are sometimes entirely wanting, or only present in a few segments, rarely in all segments. The lengths of the tarsus, tibia, and femur are also used to separate species. The cerci are quite different in size and structure in the different species. The setal arrangement on body and appendages is more or less constant in certain species, but they have not been widely used in the keys because the setae seem rather difficult to use for diagnostic purposes.

LARVAL KEY TO GENERA

1. Abdominal tergites broad, covering the entire dorsum later-

ally; mandible rather slender and curved; scrobe absent; retinaculum subbasal, slender, and curved backward; bases of ligular setae contiguous; setae of lacinia on apex; ocellar furrow absent; cervical groove absent; stem of epicranial suture very short; head with a transverse constriction; body pubescent; praeterga present on the terga of abdominal segment 1-9; tarsus longer than tibia, the length of tarsus and tibia together longer than femur; claws of each leg subequal; cercus usually very long..... 2

- 1-. Abdominal tergites narrow, not covering the entire dorsum laterally; mandible rather stout, scrobe usually present; retinaculum located near middle of cutting edge, directed more mesad; bases of ligular setae usually separate; setae of lacinia on side or on apex; ocellar furrow present and extending backward or inconspicuous; cervical groove generally present; stem of epicranial suture long; head without a transverse constriction; praeterga present or absent on terga of abdominal segments; length of tarsus and tibia together not longer than femur; claws of each leg unequal 3
2. First segment of labial palpus with only three or four setae; body less setose; cercus not very long, with few setae.....
..... *Oodes* sp.
- 2-. First segment of labial palpus with more than three setae; body setose; cercus very long, with many small setae.....
..... *Chlaenius*
3. Bases of ligular setae separate 4
- 3-. Bases of ligular setae contiguous 11
4. Ocellar furrow present and extending backward 8
- 4-. Ocellar furrow absent 5
5. With a row of setae in the place of ocellar furrow.....
..... *Nothopus zabroides*
- 5-. Without a row of setae in the place of ocellar furrow..... 6
6. Lacinia fused with stipes forming a stout lobe
..... *Anisotarsus sayi*
- 6-. Lacinia distinct, not fused with stipes, and with a setae on the apex or on the side 7

7. Setae of lacinia on apex; with one setae on scrobe region; praeterga of abdominal segments wanting; cercus shorter than ninth abdominal segment *Cratocara capitata*
- 7-. Setae of lacinia on the side; with three setae on scrobe region; praeterga present on terga of first to ninth abdominal segments; cercus longer than ninth abdominal segment....
..... *Anisodactylus* (in part)
8. Apex of cercus with four setae; cercus shorter than tenth abdominal segment; bases of cerci broadly separated.....
..... *Cratacanthus*
- 8-. Apex of cercus with less than four setae; cercus longer or subequal to tenth abdominal segment; bases of cerci narrowly separated 9
9. Ocellar furrow rather broad; with a swollen area bearing two setae above the furrow and behind the ocelli
..... *Anisodactylus californicus*
- 9-. Ocellar furrow not so broad; without a swollen area bearing two setae above it 10
10. Praeterga present on first to ninth abdominal segments; seta of lacinia on apex; nasale with two pairs of blunt teeth, each tooth dentated.....*Amphasia interstitialis*
- 10-. Praeterga never present on fifth to eighth abdominal segments; seta of lacinia on side; nasale not so dentated.....
.....*Harpalus* (in part)
11. Praeterga present on first to ninth abdominal segments.....
..... *Harpalus dichrous*
- 11-. Praeterga wanting on terga of all abdominal segments.....12
12. Mandibular scrobe well developed, with two setae; setae of lacinia on side 13
- 12-. Mandibular scrobe wanting, with one seta on that region; seta of lacinia on apex*Stenocellus rupestris*
13. Nasale without a large median tooth; abdominal terga with ten strong setae in two rows, six in cephalic row and four in caudal row; trochanter with less than five spinulae on each

side; with two setae on scrobe, no seta on dorsum of mandible *Stenolophus*

- 13-. Nasale with a large median tooth; abdominal terga with many setae, at least more than ten in two rows; with one seta on scrobe and one seta on the dorsum of mandible....*Agonoderus*

The species studied are listed below:

<i>Chlaenius pennsylvanicus</i> Say.	<i>Harpalus erythropus</i> Dejean.
<i>Chlaenius tricolor</i> Dejean.	<i>Harpalus compar</i> LeConte.
<i>Chlaenius prasinus</i> Dejean.	<i>Harpalus pennsylvanicus</i> Say.
<i>Chlaenius cumatilis</i> LeConte.	<i>Harpalus dichrous</i> Dejean.
<i>Chlaenius sericeus</i> Forster.	<i>Anisodactylus californicus</i>
<i>Oodes</i> sp.	Dejean.
<i>Nothopus zabroides</i> LeConte.	<i>Anisodactylus</i> (or close) sp.
<i>Cratacanthus dubius</i>	<i>Ampahsia interstitialis</i> (Say).
(Beauvois).	<i>Anisotarsus sayi</i> (Blatchley).
<i>Cratacanthus</i> sp.	<i>Stenocellus rupestris</i> (Say).
<i>Harpalus caliginosus</i> ?	<i>Stenolophus conjunctus</i> (Say).
(Fabricius).	<i>Stenolophus</i> sp.
<i>Harpalus</i> sp.	<i>Agonoderus lineola</i> (Fabricius).
<i>Harpalus viridiaeneus</i>	<i>Agonoderus pallipes</i>
Beauvois.	(Fabricius).
<i>Harpalus vagans</i> LeConte.	<i>Cratocara capitata</i> Chaudoir.

VITA

Pao Chu, more properly known as Hung Fu Chu, was born January 13, 1913, in Nantung, Kiangsu, China. His primary school was near his home. He was educated in the Nantung Middle School for six years and entered the Tsing Hua University in the autumn of 1931. There he received his degree of Bachelor of Science in July, 1935. Following his graduation, he worked in the Division of Entomology, Institute of Agricultural Research at the same institution as a research assistant for six years, studying cotton aphids and life-histories of other crop insects. During the Japanese invasion of China in July, 1937, he was surrounded in his university by the Japanese army for a week and eventually escaped, following his university from Northern China to Changsha, Hunan, in Central China. After three months, he again moved with his university to Kunming, Yunnan, via Hongkong and Indo-China. His work in Yunnan was on the pear fruit-fly and on insect pest survey. In the winter of 1938, he had a difficult, but interesting expedition to the southwestern part of Yunnan bordering Burma, in company with geologists, phytopathologists, engineers, and medical doctors appointed by the Provincial Government of Yunnan. This is a mountainous region with virgin forests and wild animals. The region visited was about a month's journey through dense jungles on horseback from Kunming. He was then sent to the United States for advanced study by his university in recognition of his services. He was flown by plane from Kunming to Hongkong where he caught the last boat to Manila before the Japanese occupation. Again catching the last boat before the Japanese invasion of Manila he came to the United States via Australia. He entered the University of Illinois, as a graduate student, in February, 1942, and received his degree of Master of Science in February, 1943. The title of his Master's thesis is *A Classification Of Some Larvae And Puparia Of The Tephritidae (Diptera)*. A tuition scholarship was granted to him by the University of Illinois from September, 1943 to June 1945. His publication is by Hayes, W. P. and H. F. Chu, *Larvae Of The Genus Nosodendron Latr.* (In press). He is an associate member of the Society of Sigma Xi and also a member of Phi Sigma Society.



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